SEQUENCE LISTING

<110> Patten, Phillip
Stemmer, Willem P.C.

<120> METHODS AND COMPOSITIONS FOR POLYPEPTIDE ENGINEERING

<130> 02-020500US

<140> 08/769,062
<141> 1996-12-18

<150> 08/198,431
<151> 1994-02-17

<150> 08/425,684
<151> 1995-04-18

<150> 08/537,874
<151> 1995-10-30

<160> 101

<170> PatentIn Ver. 2.0

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oligonucleotide used for codon usage library

<400> 3
aaccctccag ttccgaaccc atatacatat gcgtgctaaa 40

<210> 4
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oligonucleotide used for codon usage library

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<210> 5
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oligonucleotide used for codon usage library

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<210> 6
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oligonucleotide used for codon usage library

<400> 6
tggtgttatg tctgctcagg cdatggcdgt dgayttycay ctggttccgg ttgaagagga 60

<210> 7
<211> 60
<212> DNA
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oligonucleotide used for codon usage library

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ggctggtttc gctaccgttg cdcargcdgc dccdaargay ctggttccgg ttgaagagga 60

<210> 8
<211> 60
<212> DNA
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oligonucleotide used for codon usage library

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<210> 9
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 9
gctgctggct gctcagccgg cdatggcdat ggayatyggy ctggttccgg ttgaagagga 60

<210> 10
<211> 61
<212> DNA
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a 61

<210> 11
<211> 60
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oligonucleotide used for codon usage library

<400> 11
cccggctttc tggaaccgtc argcdgcdca rgcdctggac gttgctaaaa aactgcagcc 60

<210> 12
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oligonucleotide used for codon usage library

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<210> 13

<211> 60
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oligonucleotide used for codon usage library

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aaactgggtc cggaaacccc dctggcdatg gaycarttyc cgtacgttgc tctgtctaaa 60

<210> 14
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oligonucleotide used for codon usage library

<400> 14
ggttccggac tctgctggta cygcdacygc dtayctgtgc ggtgttaaag gtaactaccg 60

<210> 15
<211> 60
<212> DNA
<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 15
ctgctcgtta caaccagtgc aaracyacyc gyggyaayga agttacctct gttatgaacc 60

<210> 16
<211> 60
<212> DNA
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oligonucleotide used for codon usage library

<400> 16
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<210> 17
<211> 60
<212> DNA
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oligonucleotide used for codon usage library

<400> 17

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<210> 18
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<212> DNA
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<220>
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oligonucleotide used for codon usage library

<400> 18
acatcgacgt tatcctgggt ggyggycgya artayatgtt cccggttggt accccggacc 60

<210> 19
<211> 60
<212> DNA
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oligonucleotide used for codon usage library

<400> 19
tctgttaacg gtgttcgtaa rcgyaarcar aayctggtdc aggcttggca ggctaaacac 60

<210> 20
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oligonucleotide used for codon usage library

<400> 20
gaaccgtacc gctctgctgc argcdgcdga ygaytcytct gttacccacc tgatgggtct 60

<210> 21
<211> 60
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oligonucleotide used for codon usage library

<400> 21
aatacaacgt tcagcaggac cayacyaarg ayccdacyct gcaggaaatg accgaagttg 60

<210> 22
<211> 60
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oligonucleotide used for codon usage library

<400> 22
aacccgcgtg gtttctacct gttygtdgar ggyggycgya tcgaccacgg tcaccacgac 60

<210> 23
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oligonucleotide used for codon usage library

<400> 23
gaccgaagct ggtatgttcg ayaaygcdat ygcdaargct aacgaactga cctctgaact 60

<210> 24
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 24
ccgctgacca ctctcacgtt ttytcyttyg gyggytayac cctgcgtggt acctctatct 60

<210> 25
<211> 60
<212> DNA
<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 25
gctctggact ctaaatctta yacytcyaty ctgtayggya acggtccggg ttacgctctg 60

<210> 26
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 26
cgttaacgac tctacctctg argayccdtc ytaycarcag caggctgctg ttccgcaggc 60

<210> 27
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 27
aagacgttgc tgttttcgct cgyggyccdc argcdcayct ggttcacggt gttgaagaag 60

<210> 28
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 28
atggctttcg ctggttgcgt dgarccdtay acygaytgya acctgccggc tccgaccacc 60

<210> 29
<211> 61
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
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<400> 29
tgctcacctg gctgcttmac cdccdccdct ggcdctgctg gctggtgcta tgctgctcct 60
c 61

<210> 30
<211> 62
<212> DNA
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oligonucleotide used for codon usage library

<400> 30
ttccgcctct agagaattct tartacagrg thgghgccag gaggagcagc atagcaccag 60
cc 62

<210> 31
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<212> DNA
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<220>
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oligonucleotide used for codon usage library

<400> 31
aagcagccag gtgagcagcg tchggratrg argthgcggt ggtcggagcc ggcaggtt 58

<210> 32
<211> 60
<212> DNA
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oligonucleotide used for codon usage library

<400> 32
cgcaaccagc gaaagccatg atrtghgcha craargtytc ttcttcaaca ccgtgaacca 60

<210> 33
<211> 60
<212> DNA
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<400> 33
gcgaaaacag caacgtcttc rccrccrtgr gtytcrgahg cctgcggaac agcagcctgc 60

<210> 34
<211> 60
<212> DNA
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oligonucleotide used for codon usage library

<400> 34
agaggtagag tcgttaacgt chggrcgrga rccrccrccc agagcgtaac ccggaccgtt 60

<210> 35
<211> 60
<212> DNA
<213> Artificial Sequence

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<400> 35
aagatttaga gtccagagct ttrgahgghg ccagrccraa gatagaggta ccacgcaggg 60

<210> 36
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 36
acgtgagagt ggtcagcggt haccagratc agrgtrtcca gttcagaggt cagttcgtta 60

<210> 37
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 37
gaacatacca gcttcggtca ghgccatrta hgcyttrtcg tcgtggtgac cgtggtcgat 60

<210> 38
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 38
ggtagaaacc acgcgggtta cgrgahacha crcgcaghgc aacttcggtc atttcctgca 60

<210> 39
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 39
tcctgctgaa cgttgtattt catrtchgch ggytcraaca gacccatcag gtgggtaaca 60

<210> 40
<211> 60
<212> DNA
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<220>
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oligonucleotide used for codon usage library

<400> 40
cagcagagcg gtacggttcc ahacrtaytg hgcrccytgg tgtttagcct gccaagcctg 60

<210> 41
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 41
tacgaacacc gttaacagaa gcrtcrtchg grtaytchgg gtccggggta ccaaccggga 60

<210> 42
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 42
cccaggataa cgtcgatgtc catrttrtth accagytghg cagcgatgtc ctggcaaccg 60

<210> 43
<211> 60
<212> DNA
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<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for codon usage library

<400> 43
caggtcagcg tcagagtacc arttrcgrtt hacrgtrtga gcgtaagcac cagccggaga 60

<210> 44
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 44
tggtaacaac accaacagat ttrcchgcyt tytthgcrcg gttcataaca gaggtaactt 60

<210> 45
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for codon usage library

<400> 45
cactggttgt aacgagcagc hgcrgahacr ccratrgtrc ggtagttacc tttaacaccg 60

<210> 46
<211> 60

<212> DNA
<213> Artificial Sequence

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oligonucleotide used for codon usage library

<400> 46
accagcagag tccggaacct grcgrtchac rttrtargtt ttagacagag caacgtacgg 60

<210> 47
<211> 60
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<220>
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oligonucleotide used for codon usage library

<400> 47
gggtttccgg acccagttta ccrttcatyt grccyttcag gatacgggta gcggtaacgg 60

<210> 48
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for codon usage library

<400> 48
cccaggaaca ggataacgtt ytthgchgcr gtytgrathg gctgcagttt tttagcaacg 60

<210> 49
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for codon usage library

<400> 49
acggttccag aaagccgggt cttcctcttc aaccggaacc ag 42

<210> 50
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 50
cctgagcaga cataacacca gchgchachg chachgccag cggcagttta cgcagggtga 60

<210> 51
<211> 62
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 51
accggggtga acagcagcgg cagcaghgcc aghgcratrg trgactgttt catatgtata 60
tc 62

<210> 52
<211> 59
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for codon usage library

<400> 52
gccggctgag cagccagcag cagcagrcch gchgchgcgg tcggcagcag gtagtttca 59

<210> 53
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
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oligonucleotide used for codon usage library

<400> 53
aagagatagc gatcggggtg gtcaghacra trcccagcag tttagcacgc atatgtatat 60

<210> 54
<211> 58
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for codon usage library

<400> 54
caacggtagc gaaaccagcc aghgchachg crathgcrat agcggttttt ttcatatg 58

<210> 55
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate

oligonucleotide used for codon usage library

<400> 55
agaattctct agaggcggaa actctccaac tcccaggtt 39

<210> 56
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate oligonucleotide used for codon usage library

<400> 56
tgagaggttg agggtccaat tgggaggtca aggcttggg 39

<210> 57
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate oligonucleotide used for alpha interferon shuffling

<400> 57
tgtratctgy ctsagacc 18

<210> 58
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate oligonucleotide used for alpha interferon shuffling

<400> 58
ggcacaaatg vgmagaatct ctc 23

<210> 59
<211> 22
<212> DNA
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<220>
<223> Description of Artificial Sequence: degenerate oligonucleotide used for alpha interferon shuffling

<400> 59
agagattctk cbcatttgtg cc 22

<210> 60

<211> 24
<212> DNA
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<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 60
cagttccaga agrctsmagc catc 24

<210> 61
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 61
gatggctksa gycttctgga actg 24

<210> 62
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 62
cttcaatctc ttcascaca 19

<210> 63
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 63
tgtgstgaag agattgaag 19

<210> 64
<211> 18
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 64
ggawsagass ctcctaga 18

<210> 65
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 65
tctaggagss tctswtcc 18

<210> 66
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 66
gaacttdwcc agcaamtgaa t 21

<210> 67
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 67
attcakttgc tggwhaagtt c 21

<210> 68
<211> 19
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<220>
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oligonucleotide used for alpha interferon
shuffling

<400> 68

ggactycatc ctggctgtg 19

<210> 69
<211> 19
<212> DNA
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<220>
<223> Description of Artificial Sequence: degenerate oligonucleotide used for alpha interferon shuffling

<400> 69
cacagccagg atgragtcc 19

<210> 70
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
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<400> 70
aagaatcact ctttatct 18

<210> 71
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate oligonucleotide used for alpha interferon shuffling

<400> 71
agataaagag tgattctt 18

<210> 72
<211> 19
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<220>
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<400> 72
tgggaggttg tcagagcag 19

<210> 73
<211> 19
<212> DNA

<213> Artificial Sequence

<220>
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oligonucleotide used for alpha interferon
shuffling

<400> 73
ctgctctgac aacctccca 19

<210> 74
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: degenerate
oligonucleotide used for alpha interferon
shuffling

<400> 74
tcawtccttm ctcyttaa 18

<210> 75
<211> 166
<212> PRT
<213> consensus alpha interferon

<400> 75
Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
1 5 10 15

Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
20 25 30

Arg His Asp Phe Gly Phe Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
35 40 45

Gln Lys Ala Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
50 55 60

Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ala Trp Glu Gln Ser
65 70 75 80

Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu
85 90 95

Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met
100 105 110

Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
115 120 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
130 135 140

Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys

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145                 150                 155                 160

Arg Leu Arg Arg Lys Asp
                165
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<210> 76
<211> 166
<212> PRT
<213> human alpha interferon

<400> 76

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Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
  1               5                  10                  15

Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
             20                  25                  30

Arg His Asp Phe Gly Leu Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
         35                  40                  45

Gln Lys Thr Gln Ala Ile Pro Val Leu His Glu Met Ile Gln Gln Thr
     50                  55                  60

Phe Asn Leu Phe Ser Thr Glu Asp Ser Ser Ala Ala Trp Glu Gln Ser
 65                  70                  75                  80

Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asn Leu
                85                  90                  95

Glu Ala Cys Val Ile Gln Glu Val Gly Met Glu Glu Thr Pro Leu Met
            100                 105                 110

Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
        115                 120                 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
    130                 135                 140

Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys
145                 150                 155                 160

Arg Leu Arg Arg Lys Asp
                165
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<210> 77
<211> 166
<212> PRT
<213> human alpha interferon

<400> 77

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Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
  1               5                  10                  15

Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
             20                  25                  30
```

```
Arg Pro Asp Phe Gly Leu Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
         35                  40                  45

Gln Lys Thr Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
     50                  55                  60

Phe Asn Leu Phe Ser Thr Glu Asp Ser Ser Ala Ala Trp Glu Gln Ser
 65                  70                  75                  80

Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asn Leu
                 85                  90                  95

Glu Ala Cys Val Ile Gln Glu Val Gly Met Glu Glu Thr Pro Leu Met
            100                 105                 110

Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
        115                 120                 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
    130                 135                 140

Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys
145                 150                 155                 160

Ile Leu Arg Arg Lys Asp
                165
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<210> 78
<211> 166
<212> PRT
<213> human alpha interferon

<400> 78

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Cys Asn Leu Ser Gln Thr His Ser Leu Asn Asn Arg Arg Thr Leu Met
  1               5                  10                  15

Leu Leu Ala Gln Met Arg Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
            20                  25                  30

Arg His Asp Phe Glu Phe Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
         35                  40                  45

Gln Lys Ala Gln Ala Ile Ser Val Leu His Glu Met Met Gln Gln Thr
     50                  55                  60

Phe Asn Leu Phe Ser Thr Lys Asn Ser Ser Ala Ala Trp Asp Glu Thr
 65                  70                  75                  80

Leu Leu Glu Lys Phe Tyr Ile Glu Leu Phe Gln Gln Met Asn Asp Leu
                 85                  90                  95

Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met
            100                 105                 110

Asn Glu Asp Ser Ile Leu Ala Val Lys Lys Tyr Phe Gln Arg Ile Thr
```

```
        115                 120                 125

Leu Tyr Leu Met Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
    130                 135                 140

Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys
145                 150                 155                 160

Arg Leu Arg Arg Lys Asp
                165
```

<210> 79
<211> 166
<212> PRT
<213> human alpha interferon

<400> 79

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Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
  1               5                  10                  15

Leu Leu Ala Gln Met Gly Arg Ile Ser His Phe Ser Cys Leu Lys Asp
             20                  25                  30

Arg His Asp Phe Gly Phe Pro Glu Glu Glu Phe Asp Gly His Gln Phe
         35                  40                  45

Gln Lys Thr Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
     50                  55                  60

Phe Asn Leu Phe Ser Thr Glu Asp Ser Ser Ala Ala Trp Glu Gln Ser
 65                  70                  75                  80

Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu
                85                  90                  95

Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met
            100                 105                 110

Asn Val Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
        115                 120                 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
    130                 135                 140

Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys
145                 150                 155                 160

Arg Leu Arg Arg Lys Asp
                165
```

<210> 80
<211> 166
<212> PRT
<213> human alpha interferon

<400> 80
Cys Asp Leu Pro Gln Thr His Ser Leu Gly His Arg Arg Thr Met Met
1 5 10 15

Leu Leu Ala Gln Met Arg Arg Ile Ser Leu Phe Ser Cys Leu Lys Asp
20 25 30

Arg His Asp Phe Arg Phe Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
35 40 45

Gln Lys Ala Glu Ala Ile Ser Val Leu His Glu Val Ile Gln Gln Thr
50 55 60

Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser Val Ala Trp Asp Glu Arg
65 70 75 80

Leu Leu Asp Lys Leu Tyr Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu
85 90 95

Glu Ala Cys Val Met Gln Glu Val Trp Val Gly Gly Thr Pro Leu Met
100 105 110

Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
115 120 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
130 135 140

Arg Ala Glu Ile Met Arg Ser Phe Ser Ser Ser Arg Asn Leu Gln Glu
145 150 155 160

Arg Leu Arg Arg Lys Glu
165

<210> 81
<211> 166
<212> PRT
<213> human alpha interferon

<400> 81
Cys Asp Leu Pro Gln Thr His Ser Leu Arg Asn Arg Arg Ala Leu Ile
1 5 10 15

Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
20 25 30

Arg His Glu Phe Arg Phe Pro Glu Glu Glu Phe Asp Gly His Gln Phe
35 40 45

Gln Lys Thr Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
50 55 60

Phe Asn Leu Phe Ser Thr Glu Asp Ser Ser Ala Ala Trp Glu Gln Ser
65 70 75 80

Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu

```
                85                  90                  95

Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met
            100                 105                 110

Asn Glu Asp Phe Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
        115                 120                 125

Leu Tyr Leu Met Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
    130                 135                 140

Arg Ala Glu Ile Met Arg Ser Phe Ser Phe Ser Thr Asn Leu Lys Lys
145                 150                 155                 160

Gly Leu Arg Arg Lys Asp
                165
```

<210> 82
<211> 166
<212> PRT
<213> human alpha interferon

<400> 82

```
Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
  1               5                  10                  15

Leu Leu Ala Gln Met Arg Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
             20                  25                  30

Arg His Asp Phe Glu Phe Pro Gln Glu Glu Phe Asp Asp Lys Gln Phe
         35                  40                  45

Gln Lys Ala Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
     50                  55                  60

Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ala Leu Asp Glu Thr
 65                  70                  75                  80

Leu Leu Asp Glu Phe Tyr Ile Glu Leu Asp Gln Gln Leu Asn Asp Leu
                85                  90                  95

Glu Ser Cys Val Met Gln Glu Val Gly Val Ile Glu Ser Pro Leu Met
            100                 105                 110

Tyr Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
        115                 120                 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Ser Cys Ala Trp Glu Val Val
    130                 135                 140

Arg Ala Glu Ile Met Arg Ser Phe Ser Leu Ser Ile Asn Leu Gln Lys
145                 150                 155                 160

Arg Leu Lys Ser Lys Glu
                165
```

<210> 83
<211> 166
<212> PRT
<213> human alpha interferon

<400> 83
Cys Asp Leu Pro Glu Thr His Ser Leu Asp Asn Arg Arg Thr Leu Met
1 5 10 15

Leu Leu Ala Gln Met Ser Arg Ile Ser Pro Ser Ser Cys Leu Met Asp
20 25 30

Arg His Asp Phe Gly Phe Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
35 40 45

Gln Lys Ala Pro Ala Ile Ser Val Leu His Glu Leu Ile Gln Gln Ile
50 55 60

Phe Asn Leu Phe Thr Thr Lys Asp Ser Ser Ala Ala Trp Asp Glu Asp
65 70 75 80

Leu Leu Asp Lys Phe Cys Thr Glu Leu Tyr Gln Gln Leu Asn Asp Leu
85 90 95

Glu Ala Cys Val Met Gln Glu Glu Arg Val Gly Glu Thr Pro Leu Met
100 105 110

Asn Ala Asp Ser Ile Leu Ala Val Lys Lys Tyr Phe Arg Arg Ile Thr
115 120 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
130 135 140

Arg Ala Glu Ile Met Arg Ser Leu Ser Leu Ser Thr Asn Leu Gln Glu
145 150 155 160

Arg Leu Arg Arg Lys Glu
165

<210> 84
<211> 166
<212> PRT
<213> human alpha interferon

<400> 84
Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
1 5 10 15

Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
20 25 30

Arg His Asp Phe Gly Phe Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
35 40 45

Gln Lys Ala Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr

```
     50                  55                  60

Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ile Trp Glu Gln Ser
 65                  70                  75                  80

Leu Leu Glu Lys Phe Ser Thr Glu Leu Asn Gln Gln Leu Asn Asp Met
                 85                  90                  95

Glu Ala Cys Val Ile Gln Glu Val Gly Val Glu Glu Thr Pro Leu Met
            100                 105                 110

Asn Val Asp Ser Ile Leu Ala Val Lys Lys Tyr Phe Gln Arg Ile Thr
        115                 120                 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
    130                 135                 140

Arg Ala Glu Ile Met Arg Ser Phe Ser Leu Ser Lys Ile Phe Gln Glu
145                 150                 155                 160

Arg Leu Arg Arg Lys Ser
                165


<210> 85
<211> 166
<212> PRT
<213> human alpha interferon

<400> 85
Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
  1               5                  10                  15

Leu Leu Ala Gln Met Gly Arg Ile Ser Pro Phe Ser Cys Leu Lys Asp
            20                  25                  30

Arg Pro Asp Phe Gly Leu Pro Gln Glu Glu Phe Asp Gly Asn Gln Phe
        35                  40                  45

Gln Lys Thr Gln Ala Ile Ser Val Leu His Glu Met Ile Gln Gln Thr
    50                  55                  60

Phe Asn Leu Phe Ser Thr Glu Asp Ser Ser Ala Ala Trp Glu Gln Ser
 65                  70                  75                  80

Leu Leu Glu Lys Phe Ser Thr Glu Leu Tyr Gln Gln Leu Asn Asn Leu
                 85                  90                  95

Glu Ala Cys Val Ile Gln Glu Val Gly Met Glu Glu Thr Pro Leu Met
            100                 105                 110

Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
        115                 120                 125

Leu Tyr Leu Thr Glu Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
    130                 135                 140
```

```
Arg Ala Glu Ile Met Arg Ser Leu Ser Phe Ser Thr Asn Leu Gln Lys
145                 150                 155                 160

Ile Leu Arg Arg Lys Asp
                165
```

<210> 86
<211> 166
<212> PRT
<213> human alpha interferon

<400> 86

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Cys Asp Leu Pro Gln Thr His Ser Leu Gly Asn Arg Arg Ala Leu Ile
  1               5                  10                  15

Leu Leu Ala Gln Met Gly Arg Ile Ser His Phe Ser Cys Leu Lys Asp
             20                  25                  30

Arg Tyr Asp Phe Gly Phe Pro Gln Glu Val Phe Asp Gly Asn Gln Phe
         35                  40                  45

Gln Lys Ala Gln Ala Ile Ser Ala Phe His Glu Met Ile Gln Gln Thr
     50                  55                  60

Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser Ala Ala Trp Asp Glu Thr
 65                  70                  75                  80

Leu Leu Asp Lys Phe Tyr Ile Glu Leu Phe Gln Gln Leu Asn Asp Leu
                 85                  90                  95

Glu Ala Cys Val Thr Gln Glu Val Gly Val Glu Glu Ile Ala Leu Met
            100                 105                 110

Asn Glu Asp Ser Ile Leu Ala Val Arg Lys Tyr Phe Gln Arg Ile Thr
        115                 120                 125

Leu Tyr Leu Met Gly Lys Lys Tyr Ser Pro Cys Ala Trp Glu Val Val
    130                 135                 140

Arg Ala Glu Ile Met Arg Ser Phe Ser Phe Ser Thr Asn Leu Gln Lys
145                 150                 155                 160

Gly Leu Arg Arg Lys Asp
                165
```

<210> 87
<211> 501
<212> DNA
<213> consensus alpha interferon

<400> 87

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atgggaagaa tctctccttt ctcctgcctg aaggacagac atgactttgg atttccccag 120
gaggagtttg atggcaacca gttccagaag gctcaagcca tctctgtcct ccatgagatg 180
atccagcaga ccttcaatct cttcagcaca aaggactcat ctgctgcttg ggatgagagc 240
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ctcctagaaa aattttccac tgaactttac cagcaactga atgacctgga agcctgtgtg 300
atacaggagg ttggggtgga agagactccc ctgatgaatg aggactccat cctggctgtg 360
aggaaatact tccaaagaat cactctttat ctgacagaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccttctctt tttcaacaaa cttgcaaaaa 480
agattaagga ggaaggattg a 501

<210> 88
<211> 501
<212> DNA
<213> human alpha interferon

<400> 88
tgtgatctgc ctcagaccca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctccttt ctcctgcctg aaggacagac atgactttgg acttccccag 120
gaggagtttg atggcaacca gttccagaag actcaagcca tccctgtcct ccatgagatg 180
atccagcaga ccttcaatct cttcagcaca gaggactcat ctgctgcttg ggaacagagc 240
ctcctagaaa aattttccac tgaactttac cagcaactga ataacctgga agcatgtgtg 300
atagaggagg ttgggatgga agagactccc ctgatgaatg aggactccat cctggctgtg 360
aggaaatact tccaaagaat cactctttat ctaacagaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccctctctt tttcaacaaa cttgcaaaaa 480
agattaagga ggaaggattg a 501

<210> 89
<211> 501
<212> DNA
<213> human alpha interferon

<400> 89
tgtgatctgc ctcagaccca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctccttt ctcctgcctg aaggacagac ctgactttgg acttccccag 120
gaggagtttg atggcaacca gttccagaag actcaagcca tctctgtcct ccatgagatg 180
atccagcaga ccttcaatct cttcagcaca gaggactcat ctgctgcttg ggaacagagc 240
ctcctagaaa aattttccac tgaactttac cagcaactga ataacctgga agcatgtgtg 300
atacaggagg ttgggatgga agagactccc ctgatgaatg aggactccat cctggctgtg 360
aggaaatact tccaaagaat cactctttat ctaacagaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tctctctctt tttcaacaaa cttgcaaaaa 480
atattaagga ggaaggattg a 501

<210> 90
<211> 501
<212> DNA
<213> human alpha interferon

<400> 90
tgtaatctgt ctcaaaccca cagcctgaat aacaggagga ctttgatgct catggcacaa 60
atgaggagaa tctctccttt ctcctgcctg aaggacagac atgactttga atttccccag 120
gaggaatttg atggcaacca gttccagaaa gctcaagcca tctctgtcct ccatgagatg 180
atgcagcaga ccttcaatct cttcagcaca aagaactcat ctgctgcttg ggatgagacc 240
ctcctagaaa aattctacat tgaacttttc cagcaaatga atgacctgga agcctgtgtg 300
atacaggagg ttggggtgga agagactccc ctgatgaatg aggactccat cctggctgtg 360
aagaaatact tccaaagaat cactctttat ctgatggaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccctctctt tttcaacaaa cttgcaaaaa 480
agattaagga ggaaggattg a 501

<210> 91
<211> 501
<212> DNA

<213> human alpha interferon

<400> 91
tgtgatctgc ctcagaccca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctccttt ctcatgcctg aaggacagac atgatttcgg attccccgag 120
gaggagtttg atggccacca gttccagaag actcaagcca tctctgtcct ccatgagatg 180
atccagcaga ccttcaatct cttcagcaca gaggactcat ctgctgcttg ggaacagagc 240
ctcctagaaa aattttccac tgaactttac cagcaactga atgacctgga agcatgtgtg 300
atacaggagg ttggggtgga agagactccc ctgatgaatg tggactccat cctggctgtg 360
aggaaatact tccaaagaat cactctttat ctaacagaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccctctcgt tttcaacaaa cttgcaaaaa 480
agattaagga ggaaggattg a 501

<210> 92
<211> 501
<212> DNA
<213> human alpha interferon

<400> 92
tgtgatctgc ctcagaccca cagcctgggt cacaggagga ccatgatgct cctggcacaa 60
atgaggagaa tctctctttt ctcctgtctg aaggacagac atgacttcag atttccccag 120
gaggagtttg atggcaacca gttccagaag gctgaagcca tctctgtcct ccatgaggtg 180
attcagcaga ccttcaatct cttcagcaca aaggactcat ctgttgcttg ggatgagagg 240
cttctagaca aactctatac tgaactttac cagcagctga atgacctgga agcctgtgtg 300
atgcaggagg tgtgggtggg agggactccc ctgatgaatg aggactccat cctggctgtg 360
agaaaatact tccaaagaat cactctctac ctgacagaga aaaagtacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccttctctt catcaagaaa cttgcaagaa 480
aggttaagga ggaaggaata a 501

<210> 93
<211> 501
<212> DNA
<213> human alpha interferon

<400> 93
tgtgatctgc ctcagaccca cagcctgcgt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctccttt ctcctgcttg aaggacagac atgaattcag attcccagag 120
gaggagtttg atggccacca gttccagaag actcaagcca tctctgtcct ccatgagatg 180
atccagcaga ccttcaatct cttcagcaca gaggactcat ctgctgcttg ggaacagagc 240
ctcctagaaa aattttccac tgaactttac cagcaactga atgacctgga agcatgtgtg 300
atacaggagg ttggggtgga agagactccc ctgatgaatg aggactccat cctggctgtg 360
aggaaatact tccaaagaat cactctttat ctaatggaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccttctctt tttcaacaaa cttgaaaaaa 480
ggattaagga ggaaggattg a 501

<210> 94
<211> 501
<212> DNA
<213> human alpha interferon

<400> 94
tgtgatctgc ctcagactca cagcctgggt aacaggaggg ccttgatact cctggcacaa 60
atgcgaagaa tctctccttt ctcctgcctg aaggacagac atgactttga attcccccag 120
gaggagtttg atgataaaca gttccagaag gctcaagcca tctctgtcct ccatgagatg 180
atccagcaga ccttcaacct cttcagcaca aaggactcat ctgctgcttt ggatgagacc 240
cttctagatg aattctacat cgaacttgac cagcagctga atgacctgga gtcctgtgtg 300
atgcaggaag tgggggtgat agagtctccc ctgatgaatg aggacttcat cctggctgtg 360

aggaaatact tccaaagaat cactctatat ctgacagaga agaaatacag ctcttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccttctctt tatcaatcaa cttgcaaaaa 480
agattgaaga gtaaggaatg a 501

<210> 95
<211> 501
<212> DNA
<213> human alpha interferon

<400> 95
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atgagcagaa tctctccttc ctcctgtctg atggacagac atgactttgg atttccccag 120
gaggagtttg atggcaacca gttccagaag gctccagcca tctctgtcct ccatgagctg 180
atccagcaga tcttcaacct cttctccaca aaagattcat ctgctgcttg ggatgaggac 240
ctcctagaca aattctgcac cgaactctac cagcagctga atgacttgga agcctgtgtg 300
atgcaggagg agagggtggg agaaactccc ctgatgtacg cggactccat cctggctgtg 360
aagaaatact tccaaagaat cactctctat ctgacagaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccctctctt tatcaacaaa cttgcaagaa 480
agattaagga ggaaggaata a 501

<210> 96
<211> 501
<212> DNA
<213> human alpha interferon

<400> 96
tgtgatctgc ctcagaccca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctccttt ctcctgcctg aaggacagac atgactttgg attcccccaa 120
gaggagtttg atggcaacca gttccagaag gctcaagcca tctctgtcct ccatgagatg 180
atccagcaga ccttcaatct cttcagcaca aaggactcat ctgctacttg ggaacagagc 240
ctcctagaaa aattttccac tgaacttaac cagcagctga atgacatgga agcctgcgtg 300
atacaggagg ttggggtgga agagactccc ctgatgaatg tggactctat cctggctgtg 360
aagaaatact tccaaagaat cactctttat ctgacagaga agaaatacag cccttgtgct 420
tgggaggttg tcagagcaga aatcatgaga tccttctctt tatcaaaaat ttttcaagaa 480
agattaagga ggaaggaatg a 501

<210> 97
<211> 501
<212> DNA
<213> human alpha interferon

<400> 97
tgtgatctgc ctcagaccca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctccttt ctcctgcctg aaggacagac ctgactttgg acttccccag 120
gaggagtttg atggcaacca gttccagaag actcaagcca tctctgtcct ccatgagatg 180
atccagcaga ccttcaatct cttcagcaca gaggactcat ctgctgcttg ggaacagagc 240
ctcctagaaa aattttccac tgaactttac cagcaactga ataacctgga agcatgtgtg 300
atacaggagg ttgggatgga agagactccc ctgatgaatg aggactccat cttggctgtg 360
aggaaatact tccaaagaat cactctttat ctaacagaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tctctctctt tttcaacaaa cttgcaaaaa 480
agattaagga ggaaggattg a 501

<210> 98
<211> 501
<212> DNA
<213> human alpha interferon

<400> 98
tgtgatctgc ctcagactca cagcctgggt aataggaggg ccttgatact cctggcacaa 60
atgggaagaa tctctcattt ctcctgcctg aaggacagat atgatttcgg attcccccag 120
gaggtgtttg atggcaacca gttccagaag gctcaagcca tctctgcctt ccatgagatg 180
atccagcaga ccttcaatct cttcagcaca aaggattcat ctgctgcttg ggatgagacc 240
ctcctagaca aattctacat tgaacttttc cagcaactga atgacctaga agcctgtgtg 300
acacaggagg ttggggtgga agagattgcc ctgatgaatg aggactccat cctggctgtg 360
aggaaatact ttcaaagaat cactctttat ctgatggaga agaaatacag cccttgtgcc 420
tgggaggttg tcagagcaga aatcatgaga tccttctctt tttcaacaaa cttgcaaaaa 480
ggattaagaa ggaaggattg a 501

<210> 99
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Protease
peptide substrate

<400> 99
Arg Gly Val Val Asn Ala Ser Ser Arg Leu Ala
1 5 10

<210> 100
<211> 44
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Introduced Sfi
I site

<400> 100
ttccatttca tacatggccg aaggggccgt gccatgagga tttt 44

<210> 101
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Introduced sfi
I site

<400> 101
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